

CHAPTER-1

INTRODUCTION TO ENVIRONMENT, ECOLOGY & ECOSYSTEM

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ENVIRONMENT

- ◉ The word “Environment” is derived from the French word “Environner” that means to encircle or surround.
- ◉ All the biological and non-biological things surrounding an organism are thus included in environment.
- ◉ **Environment can be defined as:**
External surroundings and conditions which directly or indirectly affects the living organism.
- ◉ **It can also be defined as:**
Environment is sum total of water, air, land, interrelationship among themselves and also with human beings, other living organisms and property.

PARTS OF ENVIRONMENT

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graph TD; A[PARTS OF ENVIRONMENT] --> B[Biotic]; A --> C[Abiotic]; B --> D[Made up all living organisms(plant, animals and microorganisms) including their reaction, interactions and interrelated actions.]; C --> E[All physical factor like temperature, humidity, water, soil, minerals, gases etc.];
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Biotic

Made up all living organisms(plant, animals and microorganisms) including their reaction, interactions and interrelated actions.

Abiotic

All physical factor like temperature, humidity, water, soil, minerals, gases etc.

ENVIRONMENTAL FACTOR OR ECOLOGICAL FACTOR

- ⦿ Any constitutes of the environment which directly or indirectly affects the growth and development of an organisms is called environmental or ecological factor
- ⦿ E.g. climatic factor, biotic factor, fire, edhaptic (related to soil) factors

ECOLOGY

- ◎ The word ecology is derived from two greek words “oikos” meaning house, habitation or place of living and “logos” meanings ‘study’.
- ◎ Ecology is the study of interrelationship between living organisms and their physical and biological environment.
- ◎ Physical environment includes light and heat or solar radiation, moisture, wind, oxygen, carbon dioxide, nutrients is in soil, water and atmosphere.
- ◎ The biological environment includes organisms of all kind as well as plants and animals.

ECOSYSTEM

- ◎ Ecosystem is made up of two words “eco” and “system”. Eco means environment and system means an interacting and interdependent complex.

Definition of Ecosystem

1. The organisms of any community besides interacting among themselves, always have functional relationship with the environment. The structural and functional system of communities and environment is called ecological system.
2. It is a community of interdependent organisms together with the environment.
3. Any unit that includes all of the organisms in a given area interacting with the physical environment, so that a flow of energy leads to clearly defined trophic structure, biotic diversity and material cycles within the system.

ENVIRONMENTAL SCIENCE

- Environment science is the study of earth, air, water, living organisms and the man with his impact on environment.
- It is highly multidisciplinary integrating disciplines of physical, chemical and biological sciences, geology, mathematics, sociology etc
- Branches of biology like Botany, zoology, Microbiology, Genetics, Biochemistry helps in understanding the biotic components and their interactions.

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- Basics concept of physics, chemistry, Geology, Atmospheric science, oceanography help us to understand the physical and chemical structure of the biotic components and energy transfer and it's flow.
- Mathematics, statics and computer sciences serve as effective tools in environment modeling and management.
- Sociology and Economics helps us to understand socio-economics aspects associated with various developmental activities.
- Environmental studies is therefore a multi disciplinary subject where different aspects are dealt with holistic approach

SCOPE OF ENVIRONMENTAL STUDIES

1. Natural resources-their conservation and management.
 2. Ecology and biodiversity
 3. Environment pollution and control
 4. Social issues in relation to development and environment.
 5. Human population and environment
-
- ◎ Environmental studies can highly specialized also which may concentrate or more technical aspects like Environmental science, Environmental engineering, environmental management etc.

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- ⦿ Environment belongs to all and in this important for all. Whatever be the occupation or age of a person, he or she will be affected by environment by his or her deeds. Thus, the environment is one subject that actually global in nature.
- ⦿ Environment studies is also very important science it deals with the most basic or routine issues like safe and clean drinking water, hygienic living conditions, clean and fresh air, fertile land, healthy food and development that is sustainable.
- ⦿ Environment studies helps to solve biggest environmental problems like acid rain, global warming, ozone depletion and resources depletion.

ENVIRONMENT EDUCATION

- It deals with man's relationship with his natural and man made surrounding, including the relation of population growth, pollution, resource allocation and depletion, conservation technology with the total human environment.
- It is the study of factors influencing ecosystems, mental and physical health, living and working conditions and pollution.
- It has very important role to play in dealing with the global and local issues of environment.
- It is important in developing awareness about the consequences and the challenges which arise due to man handling the environment.
- It also help in improving the attitude towards environment and in understanding the environment in a better way.
- It also improves the skills pertaining to conservation of resources and maintaining ecological balance and sustainable development

OBJECTIVE OF ENVIRONMENTAL EDUCATION

- To increase awareness and sensitivity to total environment.
- To increase the knowledge of environment.
- To improve attitude towards environment.
- To provide motivation for environmental protection.
- To increase participation and to develop a sense of responsibility and urgency regarding environmental problems and to ensure appropriate actions to solve the problems.

PRINCIPAL OF ENVIRONMENTAL EDUCATION

- ◉ It consider environment in totality
- ◉ It is not a short learning process but it requires a holistic approach as it is multidisciplinary in nature.
- ◉ Environmental hazards are controllable and every citizen has a moral obligation and towards this.
- ◉ Education can be given to all section of societies
- ◉ Promote the value and necessity of cooperation at personal, local and national level in the prevention of environmental problems and solution for it.
- ◉ Help learner to discover the systems and causes of environmental problems.
- ◉ Concerns of environment are concerns of several agencies and everybody should work together.

COMPONENTS OF ENVIRONMENT

Environment can be divided in to 4 parts

1. Atmosphere
2. Hydrosphere
3. Lithosphere
4. Biosphere

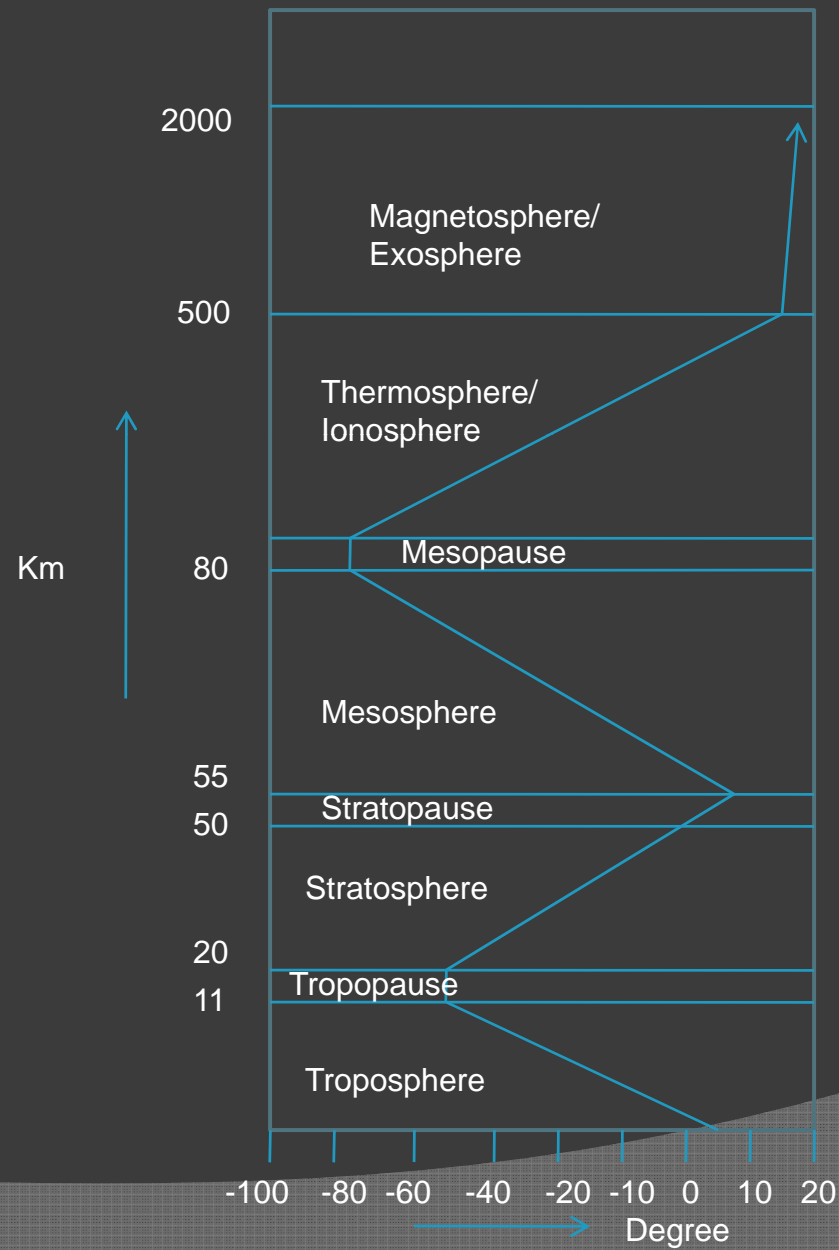
1. ATMOSPHERE

- Atmosphere= mixture of (gases +vapor + subatomic particles) that entirely covers the earth extending outward several kilometers.
- Major gases:

Gases	% concentration
N ₂	78%
O ₂	21%
Ar	0.9-1 %
Others	00.1-0.1 %

- Others include CO₂, Ne, He, CH₄, H₂, CO, O₃

STRUCTURE OF ATMOSPHERE



Structure of Atmosphere	Distance, km	Temperature, °C	Property
Troposphere	10-11	5-7 C/km (temp decrease)	Vertical air movement, which is responsible for rapid and complete mixing
Stratosphere	11-55	(temp increase)	Ozone layer
Mesosphere	55-80	-75 (temp decrease)	--
Thermosphere	Upto 500	(temp increase)	The heating in this layer due to absorption of the solar energy. Within the thermosphere there is a layer of charged particles known as ionosphere
Exosphere	Upto 2000	≥ 1200 (temp increase)	Airless and empty, probably H_2 gas is ionized in this state

HYDROSPHERE

- Water environment
- 70% of earth is covered water
- Water: Sea Ocean, lake, River, glaciers
- It is estimates 1360 million cubic km of water.
- Out of this 97 % Ocean and sea, 2% in glaciers and icecaps, 1% fresh water

LITHOSPHERE

- The outer soil crust of the earth is lithosphere
- The living organisms, plant, and vegetation are supported by the lithosphere.
- It also contains resources like minerals, organic as well as inorganic matter and to some extent of air and water.
- It plays an important role as it not only produces food for human beings and animals, but also the decomposition of organic wastes is carried out by a host of microorganisms in the soil.

BIOSPHERE

- ◉ Thin outer crust
- ◉ Includes living organism and their environment
- ◉ It extends from the lowest sea bed level to about 24 km of the atmosphere.
- ◉ Biosphere= Lithosphere +Hydrosphere+ atmosphere
- ◉ The life supporting resources are also available from biosphere
- ◉ The waste products in gases, liquids and solids waste forms are discharged into biosphere.
- ◉ Though the sustaining and assimilative capacity of the biosphere is tremendous but it is not infinite.
- ◉ The system is in operation for millions of years but now it is showing stress, primarily due to impact of human upon environment.

ENVIRONMENTAL POLLUTION

- **Pollutant:** For normal and healthy living a conducive environment is required by all the living beings. The favorable unpolluted or clean environment has a specified composition. When this consumption gets changed by addition of harmful substances, the environment is called polluted environment and the substance polluting it is called pollutant

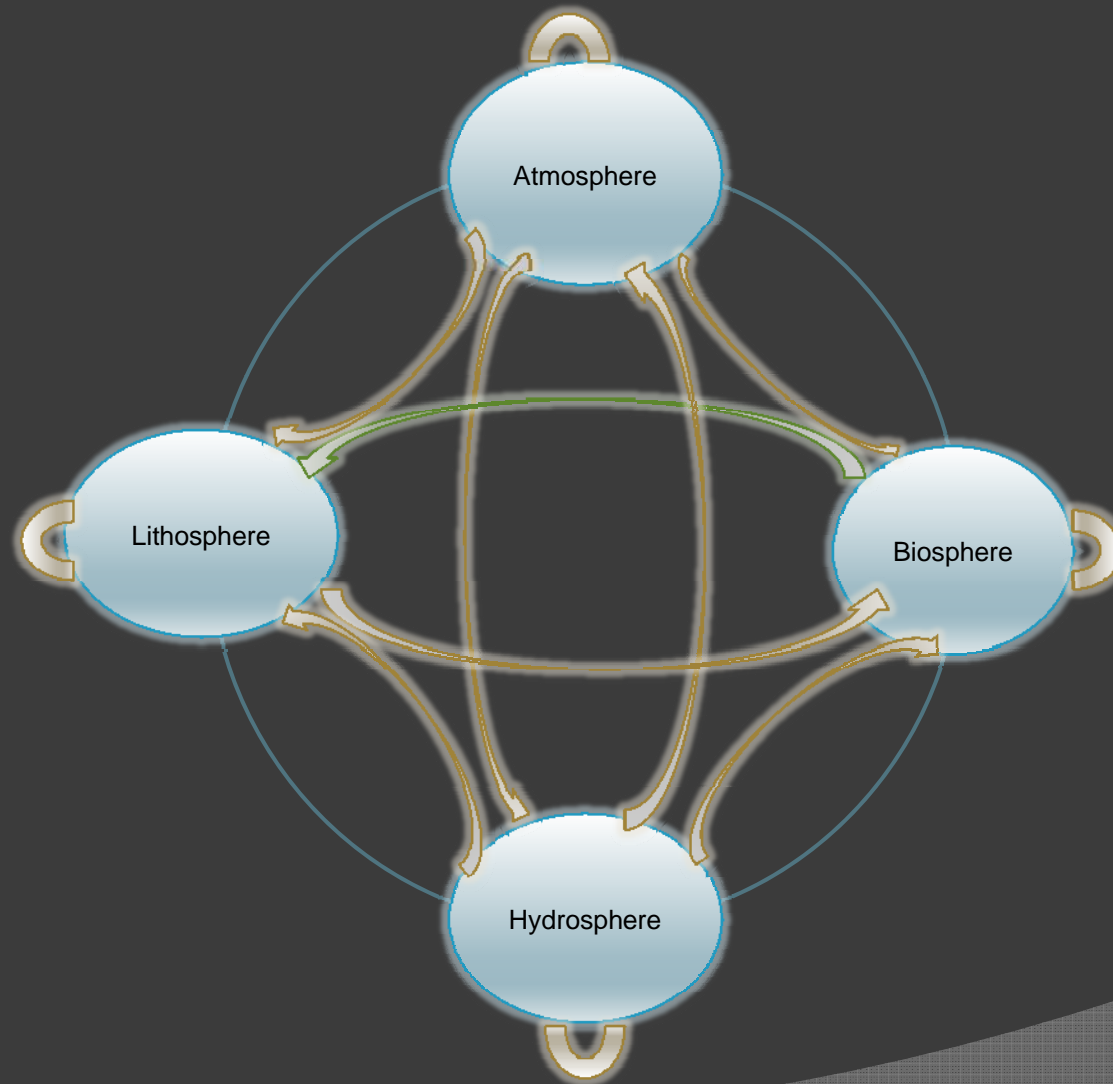
ENVIRONMENTAL POLLUTION

- ① **Environmental Pollution:** Any undesirable changes in the physical, chemical or biological characteristics of any components of the environment (air, water, soil) which can cause harmful effects on various forms of life or property.

The various types of pollutants are:

1. Air Pollution
2. Water Pollution
3. Noise Pollution
4. Land Pollution
5. Thermal Pollution

INTERACTION BETWEEN DIFFERENT COMPONENT OF ENVIRONMENT



INTERACTION BETWEEN DIFFERENT COMPONENT OF ENVIRONMENT

- Circle indicate sphere and curved arrow indicates the flow path of matter.
- There is closed, dynamic, inseparable, organic coupling or interrelationship among environment components.
- If one components changes, other component respond.
- Every sphere has two way linkages to every other sphere including itself.
- The two way linkages matter flow one component to another component to both direction.
- Some arrow show transfer within a given components from one location indicating movement of the substance from one physical location to another without leaving the sphere.
- Since the matter cannot be destroyed or created, the major objective is to find the location and chemical form of the substance at any given time

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- **Atmosphere** – transport component to receptor – storage capacity small – great capacity for spatially redistributing matter.

- **Hydrosphere**- classified 2 sub component

It Convey to **rivers** system which collects the substances within the watershed and delivers then to second subcomponent to **ocean**

- **Lithosphere**: solid shell of inorganic materials on the surface of the earth.

It composed soil particles + under laying rocks downs to the depth of 50 km


Soil biochemical reactions by microorganisms are responsible for most of the chemicals changes of matter

- **Biosphere**: thin shell of organic matter +comprising all living beings – It is sum total of Hydrosphere + Lithosphere+ atmosphere

IMPACT OF HUMAN ON ENVIRONMENT OR IMPACT OF TECHNOLOGY DEVELOPMENT ON ENVIRONMENT

- ⦿ Natural forces disturb quality of environment.
- ⦿ Increase the comfort started disturbing each and every component of environment
- ⦿ Cutting of trees
- ⦿ Hunting/Killing of animals
- ⦿ Large scale deforestation
- ⦿ Burning of fire
- ⦿ Grass crop waste
- ⦿ Endangering the species
- ⦿ Industrial revolution
- ⦿ Use of fossil fuel more..
- ⦿ Vehicle pollution
- ⦿ Major environmental issues: Global warming, Ozone layer depletion, acid rain, population explosion

IMPACT OF URBANIZATION ON VARIOUS COMPONENT OF ENVIRONMENT

Environmental Component	Population (numbers and density)	Land use	Transportation	Services
Atmosphere	 <p>CO₂ and O₂ as plants destroyed by spreading urban area</p>	Increased average temperature for most urban area	Air pollution from combustion of fuels creation of photochemical smog	PM and Nox fumes from incinerator, landfills and sewage treatment plants
Hydrosphere	Greater demand on water resources(surface and GW)	More intense use of hydrologic resources causing increased pollution	Rain and surface waters polluted with lead. Drainage patterns altered infrastructure	Leaching of pollutants from landfills. Discharges from sewage outfalls pollution from boats
Lithosphere	Increased transformation of uninhabited agricultural or unutilized land to urban uses	Complete changes due to construction, landscaping, etc	Disruption or disfigurement of landscape etc	Sanitary landfill of urban wastes and installation/repairs of services disturb landscape

ENVIRONMENTAL DEGRADATION

Environmental degradation: “The overall lowering of environmental qualities due to damaged caused by both natural events and human activities in the basic structure of the environment at local, regional and global levels adversely affecting all living organisms including man”.

Reason :

- ◉ Increase of population growth
- ◉ Rapid deforestation
- ◉ Industrialization
- ◉ Unplanned urbanization
- ◉ Nuclear explotion
- ◉ Releasing toxic gases from atmosphere
- ◉ Power plants
- ◉ Natural activity
- ◉ Consumption of natural resources by over population of the developing countries
- ◉ Wasteful over consumption of resources by developed countries

Effects:

- ◉ Destruction of environment stability and ecology balance
- ◉ Natural activity like forest fire. Deforestation, earthquake, floods, volcanic eruption

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Impact can be calculate by following equation

$$I = P * A * T$$

Where,

I= Impact

P= Population size

T= Degradation pollution caused per unit of resources used

A=Per capita consumption of resources

In developing countries Ps or P3 i.e. population, poverty and pollution are key factor for rapid environmental urbanization which cause high rate degradation

SUSTAINABLE DEVELOPMENT

- SD is the need of present with compromising the need of future generation,
- In other words, ever generation should leave air, water and soil as pure and unpolluted as possible. Although it is a difficult thing, it can be achieved through proper environmental management.
- To meet basic requirement with increase of population, industrialization is must, but it results in pollution, environmental degradation and causes ecology unbalance.
- As the same time industrialization create job oppurtunity, rises the standard of living and solve unemployment problem.
- So require balance between environment and development simultaneously, to achive goal SD is only answer.

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- ⦿ SD can be done if following concept are taken care of:
- ⦿ Control of pollution
- ⦿ Reduction of excessive use of resources
- ⦿ Resource conservation
- ⦿ Use renewable energy sources
- ⦿ Recycling and reuse of material for waste minimization
- ⦿ Use cleaner fuel and technology
- ⦿ Concentrating more on social and economic development of the community
- ⦿ Development of good mass transport facility to reduce pollution
- ⦿ By using effective management tool like Environmental management system like ISO 14001, Environment Impact assessment (EIA) etc

TUTORIAL-1

1. Define: Environment, Pollution, Pollutant, Environmental Science
2. What are the components of Environment?
3. What are the impact on technology development on environment?
4. Write a short note on environmental Degradation
5. Write a short note on Sustainable Development
6. What are the scope and principles of Environment education?

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